

### **American chaffseed**

USFWS optimal survey window: May-August (1-2 months after a fire)

Habitat Description: American chaffseed generally occurs in habitats described as open, moist to dryish Mesic Pine Flatwoods and longleaf pine flatlands, Pine Savannas, Pine/Scrub Oak Sandhills, Sandhill Seeps, and other open grass/sedge-dominated communities. This herb also occurs in the ecotonal areas between peaty wetlands and xeric sandy soils and on the upper ecotones of, or sites close, to Streamhead Pocosins. The species prefers sandy peat or sandy loam, acidic, seasonally moist to dry soils in sunny or partly sunny areas subject to frequent fires in the growing season. The plant is dependent on factors such as fire, mowing, or fluctuating water tables to maintain its required open to partly-open habitat. Most extant populations, and all of the most vigorous populations, are in areas subject to frequent fire. This species is also known to occur on road cuts and power line rights-of-way that experience frequent mowing or clearing. Soil series that it is found on include Blaney, Candor, Gelead, Fuquay, Lakeland, and Vacluse.

Biological Conclusion:

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. American Chaffseed (*Schwalbea americana*) Recovery Plan. Hadley, Massachusetts. 62 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. American chaffseed in North Carolina. <http://www.fws.gov/nc-es/plant/chaffseed.html> (Accessed: January 17, 2008).

### **Blue Ridge goldenrod**

USFWS optimal survey window: July-September

Habitat Description: Blue Ridge goldenrod, endemic to the Appalachian Mountains of North Carolina and Tennessee, occurs in the High Elevation Rocky Summit natural community at or above elevations of 4,600 feet above mean sea level along cliffs, ledges, balds, and dry rock crevices of granite outcrops of the higher mountain peaks. This early pioneer herb grows in full sun on generally acidic soils of shallow humus or clay loams that are intermittently saturated. The encroachment of woody vegetation such as ericaceous shrubs can eliminate the goldenrod through competition and shading. Roan Mountain bluet, Heller's blazing star, and spreading avens are a few of its common associate species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; Determination of Threatened Status for *Solidago spithamea* (Blue Ridge goldenrod). 50 FR 12306-12309.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

### **Bunched arrowhead**

USFWS optimal survey window: mid May-July

Habitat Description: Bunched arrowhead, endemic to the southern Appalachian Mountains of North Carolina and upper Piedmont of South Carolina, is rooted in shallow water seepage areas of bogs, wooded swamps, and deciduous woods. This early-successional perennial herb occurs in Swamp Forest-Bog Complex (Typic Subtype) and Southern Appalachian Bog (Southern Subtype) natural communities. A known population also occurs in a maintained power line right-of-way along the headwaters of a river. The plant requires a slight but continuous and steady flow of cool, clean water that saturates or floods but does not stagnate. The species typically occurs in sandy loam soils found underneath a 10-24 inch deep layer of muck, sand, and silt. Undisturbed occurrences are usually located just below the origin of the seep on gently sloping terrain at the bluff-floodplain ecotone. While shaded areas contain the most vigorous plants, it will also grow in either full sun or partial shade beneath red maple, black gum, and alder at the base of steep slopes.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1979. Determination that *Sagittaria fasciculata* is an Endangered Species. 44 FR 43700-43701.

[USFWS] U.S. Fish and Wildlife Service. 1995. Endangered Species Information: Bunched Arrowhead. Asheville, NC. 2 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Bunched Arrowhead in North Carolina. <http://www.fws.gov/nc-es/plant/barrow.html> (Accessed: January 17, 2008).

### **Canby's dropwort**

USFWS optimal survey window: mid August-September

Habitat Description: Canby's dropwort occurs in the Coastal Plain and Sandhills in moist habitat areas such as Cypress Savannas, wet meadows, wet pineland savannas, ditches, cypress-pine swamps or sloughs, grass-sedge dominated Carolina bays, and the shallows and edges of cypress/pine ponds. The most vigorous occurrences are found in open bays and ponds that are wet for most of the year with little or no canopy cover. Ideal soils for this perennial herb are acidic, deep, and poorly drained sandy loams or peat-mucks underlain by a clay layer, and have a medium to high organic content and high water table. Soil series that support the species include Coxville, Grady, McColl, Portsmouth, Rains, and Rembert. The plant is restricted to a narrow, intermediate range of mean water depths where too much or too little water can adversely affect it. Evidence of infrequent and shallow inundations is also found at site occurrences.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Canby's Dropwort Recovery Plan. Atlanta, Georgia. 25 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Canby's Dropwort in North Carolina. <http://www.fws.gov/nc-es/plant/canbydrop.html> (Accessed: January 18, 2008).

### **Cooley's meadowrue**

USFWS optimal survey window: mid June-early July

Habitat Description: Cooley's meadowrue, documented in the Pine Savanna natural community, occurs in circumneutral soils in sunny, moist to wet grass-sedge bogs, wet-pine savannas over calcareous clays, and savannah-like areas, often at the ecotones of intermittent drainages or non-riverine swamp forests. This rhizomatous perennial herb is also found along plowed firebreaks, roadside ditches and rights-of-way, forest clearings dominated by grass or sedge, and power line or utility rights-of-way. The species requires some type of disturbance (*e.g.*, mowing, clearing, periodic fire) to maintain its open habitat. The plant typically occurs on slightly acidic (pH 5.8-6.6) soils that are loamy fine sand, sandy loam, or fine sandy loam; at least seasonally moist or saturated; and mapped as Foreston, Grifton, Muckalee, Torhunta, or Woodington series. Atlantic white cedar, tulip poplar, golden sedge, and bald and pond cypress are a few of its common associate species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Cooley's Meadowrue Recovery Plan. Atlanta, GA. 29 pp.

[USFWS] U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Endangered Status for *Carex lutea* (Golden Sedge). 67 FR 3120-3126.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Cooley's Meadowrue (*Thalictrum cooleyi*). <http://www.fws.gov/nc-es/plant/coolmeadow.html> (Accessed: January 17, 2008).

### **Dwarf-flowered heartleaf**

USFWS optimal survey window: March-May

Habitat Description: Dwarf-flowered heartleaf is endemic to the western Piedmont and foothills of North and South Carolina. This herbaceous evergreen is found in moist to rather dry forests along bluffs; boggy areas next to streams and creek heads; and adjacent hillsides, slopes, and ravines. Requiring acidic, sandy loam soils, the species is found in soil series such as Pacolet, Madison, and Musella, among others. Occurrences are generally found on a north facing slope. Undisturbed natural communities such as Piedmont/Coastal Plain Heath Bluff, Dry-Mesic Oak Hickory Forest, and Mesic Mixed Hardwood Forest hold the most viable populations. However, less viable remnant populations are found in disturbed habitats, including logged, grazed, mown, and residential/commercial developed lands; areas converted to pasture, orchards, and tree plantations; roadside rights-of-way; and on upland slopes surrounding manmade ponds or lakes.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Padgett, James Edward. 2004. Biogeographical, Ecological, Morphological, and Micromorphological Analyses of the Species in the *Hexastylis heterophylla* Complex. Appalachian State University, Boone, NC. 124 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1989. Endangered and Threatened Wildlife and Plants; Threatened Status of *Hexastylis naniflora* (Dwarf-flowered heartleaf). 54 FR 14964-14967.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. 2007. Dwarf-flowered heartleaf (*Hexastylis naniflora*) 5-Year Review: Summary and Evaluation, Draft. Asheville, NC. 51 pp.

### **Golden sedge**

USFWS optimal survey window: mid-April–mid-June

Habitat Description: Golden sedge, a very rare endemic of the Atlantic Coastal Plain, grows in sandy soils overlying calcareous deposits of coquina limestone, where the soil pH, typically between 5.5 and 7.2, is unusually high for this region. The perennial prefers the ecotone between the pine savanna and adjacent wet hardwood or hardwood/conifer forest. Most plants occur in the partially shaded savanna/swamp where occasional to frequent fires favor an herbaceous ground layer and suppress shrub dominance. Soils supporting the species are very wet to periodically shallowly inundated. Other occurrences can occur on disturbed areas such as roadside and drainage ditches or power line rights-of-way, where mowing and/or very wet conditions suppress woody plants. Poorly viable populations may occur in significantly disturbed areas where ditching activities that lower the water table and/or some evidence of fire suppression threatens the species. Tulip poplar, pond cypress, red maple, wax myrtle, colic root, and Cooley's meadowrue are a few of its associate species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[USFWS] U.S. Fish and Wildlife Service. 2002. Endangered and Threatened Wildlife and Plants; Endangered Status for *Carex lutea* (Golden Sedge). 67 FR 3120-3126.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

### **Green pitcher-plant**

USFWS optimal survey window: late April-October

Habitat Description: The habitat of green pitcher plant, found in North Carolina's Blue Ridge Province, varies from moderately to steeply sloped seepage bogs (Southern Appalachian Bog-Southern Subtype) and boggy stream banks in North Carolina and Alabama to poorly drained oak and oak-pine flatwoods with a high water table during the winter months in Georgia. Soils of all known occurrences are generally acidic and derived from sandstones or shales. Soils of the flatwood and

seepage bog habitat sites are sandy clays or loams, while those of the stream bank habitat sites are almost pure sand. This carnivorous herb is dependent on some form of disturbance, often periodic fire, to keep its habitat in an early successional stage and reduce competition. Flooding also appears to maintain, and perhaps create, the plant's suitable habitat in its stream bank environment by eliminating competing species. The species often occurs with plant species that are disjunct from their usual Coastal Plain distribution.

**Biological Conclusion:**

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Green Pitcher Plant Recovery Plan. Jackson, Mississippi. 23 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

**Harperella**

USFWS optimal survey window: July-October in periods of low water

Habitat Description: Harperella, found in North Carolina's eastern Piedmont and western Coastal Plain, comprises populations that occupy both riverine and ponded habitats. In the riverine habitat, this annual herb occurs in the Rocky Bar and Shore natural community, and grows on rocky, sandy, or gravelly shoals and margins of clear, swift flowing reaches of seasonally flooded streams. It can also be in such fluvial habitats as crevices of exposed bedrock and, rarely, along sheltered muddy stream banks. The species is typically found in riverine microsites, such as the downstream side of large rocks or amidst thick clones of water willow, that are sheltered from the erosive effects of swift water. In Harperella's ponded habitat, the species is found in the Coastal Plain along the edges of intermittent pineland ponds, damp meadows, and soggy ground around springs. These areas tend to be seasonally flooded and contain soils of a peat muck overlying sand or sandy silt. An occurrence in Georgia's Coastal Plain also occurs on a granite outcrop that is unrelated to its ponded habitat. In riverine and pond environments, the plant is restricted to a very narrow, intermediate range of mean water depths and moderate, periodic flooding. It is entirely absent from both the shallowest or driest areas as well as deep waters. The species can tolerate a lot of shade.

**Biological Conclusion:**



NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Harperella (*Ptilimnium nodosum*) Recovery Plan. Newton Corner, Massachusetts. 60 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Harperella in North Carolina. <http://www.fws.gov/nc-es/plant/harperella.html> (Accessed: January 18, 2008).

### **Heller's blazing star**

USFWS optimal survey window: July-September

Habitat Description: Heller's blazing star, endemic to the Blue Ridge Mountains of North Carolina, occurs in the High Elevation Rocky Summit natural community on high elevation ledges, rock outcrops, cliffs, and balds at elevations of 3,500–5,999 feet above mean sea level. This early pioneer, perennial herb grows in acidic and generally shallow humus or clay loams on igneous and metasedimentary rock. Known populations are intermittently saturated and excessively to moderately poorly drained. The plant generally occurs in full sunlight with grasses, sedges, and other composites. Blue Ridge goldenrod, Roan Mountain bluet, and spreading avens are a few of its common associate species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.



[USFWS] U.S. Fish and Wildlife Service. 1999. Recovery Plan for *Liatrus helleri* Porter (Heller's Blazing Star). First Revision. Atlanta, GA. 25 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

### **Michaux's sumac**

USFWS optimal survey window: May-October

Habitat Description: Michaux's sumac, endemic to the inner Coastal Plain and lower Piedmont, grows in sandy or rocky, open, upland woods on acidic or circumneutral, well-drained sands or sandy loam soils with low cation exchange capacities. The species is also found on sandy or submesic loamy swales and depressions in the fall line Sandhills region as well as in openings along the rim of Carolina bays; maintained railroad, roadside, power line, and utility rights-of-way; areas where forest canopies have been opened up by blowdowns and/or storm damage; small wildlife food plots; abandoned building sites; under sparse to moderately dense pine or pine/hardwood canopies; and in and along edges of other artificially maintained clearings undergoing natural succession. In the central Piedmont, it occurs on clayey soils derived from mafic rocks. The plant is shade intolerant and, therefore, grows best where disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) maintains its open habitat.

Biological Conclusion:

[DOA] Department Of the Army. 2007. Michaux's Sumac (*Rhus michauxii*). [http://www.bragg.army.mil/esb/michaux's\\_sumac.htm](http://www.bragg.army.mil/esb/michaux's_sumac.htm) (Accessed: July 20, 2007).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Michaux's Sumac Recovery Plan. Atlanta, Georgia. 30 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Michaux's Sumac in North Carolina. <http://www.fws.gov/nc-es/plant/michsumac.html> (Accessed: January 18, 2008).

### **Mountain golden-heather: Critical Habitat Designation**

Critical Habitat Description: Burke County, North Carolina contains a Critical Habitat area designated for mountain golden-heather. This area occurs within Pisgah National Forest along the Linville Gorge Wilderness Boundary, Shortoff Mountain, Table Rock Mountain, and the 3,400 and 2,200-foot elevation contours.

Critical Habitat Biological Conclusion:

[USFWS] U.S. Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Determination of *Hudsonia montana* to be a Threatened Species, With Critical Habitat. 45 FR 69360-69363.

### **Mountain golden-heather**

USFWS optimal survey window: late May-early June

Habitat Description: Mountain golden-heather, endemic to the Blue Ridge Mountains of North Carolina, occurs in Pine-Oak/Heath and Montane Acidic Cliff natural communities on rock cliffs and shrub balds at elevations of 2,800-4,000 feet above mean sea level. This needle-leaved perennial shrub prefers exposed, wind-swept quartzite or mica gneiss ledges in a sparsely vegetated ecotone between bare rock and sand myrtle-dominated heath balds that merge into a pine/oak forest. Plants require periodic fire to maintain its suitably open habitat, although they may survive for awhile in areas shaded by pine trees.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1980. Endangered and Threatened Wildlife and Plants; Determination of *Hudsonia montana* to be a Threatened Species, With Critical Habitat. 45 FR 69360-69363.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

### **Mountain sweet pitcher plant**

USFWS optimal survey window: April-October

Habitat Description: Mountain sweet pitcher plant, endemic to the Blue Ridge

Mountains of North and South Carolina, is found along stream banks and in shrub/herb-dominated, seepage-fed mountain bogs (Southern Appalachian Bog-Southern Subtype). Both stream bank and bog habitats are usually situated along intermittently exposed to intermittently flooded level depressions associated with valley floodplains. These habitats, typically on soils of the Toxaway or Hatboro series, contain deep, poorly drained, saturated soils of loam, sand, and silt with a high organic matter content and medium to high acidity. A few occurrences of the pitcher plant also grow in cataract bogs, either in thin strips along the edges of waterfalls or on soil islands over granite rock faces, where sphagnum and other bog plant species line the sides. This early successional species relies on natural disturbance (*e.g.*, drought, water fluctuation, periodic fire, ice damage) to maintain its habitat by preventing the establishment of later successional woody seedlings.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1990. Mountain Sweet Pitcher Plant Recovery Plan. Atlanta, Georgia. 39 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

### **Pondberry or southern spicebush**

USFWS optimal survey window: February-October

Habitat Description: Pondberry occurs in seasonally flooded wetlands, sandy sinks, pond margins, and swampy depressions. This deciduous, aromatic shrub occurs in bottomland hardwood forests with perched water tables along inland areas of the southeastern United States. In the Coastal Plain of the Carolinas, the species occurs at the margins of limestone sinks and ponds and in undrained, shallow depressions of longleaf pine and pond pine forests. Known populations in North Carolina occur in the Small Depression Pocosin natural community, grow in soils with sandy sediments and high water table, contain high peat content in the subsurface, and include a prevalence of shrubs due to historically frequent or intense fires. It generally grows in somewhat shaded areas, but can tolerate full sun.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Recovery Plan for Pondberry (*Lindera melissifolia*). Atlanta, Georgia. 56 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Pondberry (Southern Spicebush) in North Carolina. <http://www.fws.gov/nc-es/plant/pondberry.html> (Accessed: January 17, 2008).

### **Roan Mountain bluet**

USFWS optimal survey window: June-July

Habitat Description: Roan Mountain bluet occurs on thin, gravelly talus slopes of grassy balds, cliff ledges, shallow soils in crevices of rock outcrops, and steep slopes with full sun at the summits of high elevations peaks of the southern Blue Ridge Mountains. The plant is found at elevations of 4,200-6,300 feet above mean sea level, and often has a north, northwest, south, or southwest aspect. Known occurrences typically grow in gravel-filled, acidic, and metamorphic-derived soil pockets between underlying mafic rock. Fraser fir and red spruce dominate the forests adjacent to known populations. Blue Ridge goldenrod, Heller's blazing star, and spreading avens are a few of its common associate species.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996. Roan Mountain Bluet Recovery Plan. Atlanta, GA. 46 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Roan Mountain Bluet in North Carolina. <http://www.fws.gov/nc-es/plant/rmbluet.html> (Accessed: January 17, 2008).

### **Rock gnome lichen**

USFWS optimal survey window: year round

Habitat Description: Rock gnome lichen occurs in high elevation coniferous forests (particularly those dominated by red spruce and Fraser fir) usually on rocky outcrop or cliff habitats. This squamulose lichen only grows in areas with a great deal of humidity, such as high elevations above 5,000 feet mean sea level where there is often fog, or on boulders and large outcrops in deep river gorges at lower elevations. Habitat is primarily limited to vertical rock faces where seepage water from forest soils above flows only at very wet times. The species requires a moderate amount of sunlight, but cannot tolerate high-intensity solar radiation. The lichen does well on moist, generally open sites with northern exposures, but requires at least partial canopy coverage on southern or western aspects because of its intolerance to high solar radiation. The rock mosses *Andreaea* and *Grimmia* are common associate species in the vertical intermittent seeps.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1997. Recovery Plan for Rock Gnome Lichen (*Gymnoderma lineare*) (Evans) Yoshimura and Sharp. Atlanta, GA. 30 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Rock Gnome Lichen in North Carolina. <http://www.fws.gov/nc-es/plant/rglichen.html> (Accessed: January 17, 2008).

### **Rough-leave loosestrife**

USFWS optimal survey window: mid May-June

Habitat Description: Rough-leaved loosestrife, endemic to the Coastal Plain and Sandhills of North and South Carolina, generally occurs in the ecotones or edges between longleaf pine uplands and pond pine pocosins in dense shrub and vine growth on moist to seasonally saturated sands and on shallow organic soils overlaying sand (spodosolic soils). Occurrences are found in such disturbed habitats as roadside depressions, maintained power and utility line rights-of-way, firebreaks, and trails. The species prefers full sunlight, is shade intolerant, and requires areas of disturbance (*e.g.*, clearing, mowing, periodic burning) where the overstory is minimal. It can, however, persist vegetatively for many years in overgrown, fire-suppressed areas. Blaney, Gilead, Johnston, Kalmia, Leon, Mandarin, Murville, Torhunta, and Vaocluse are some of the soil series that occurrences have been found on.

Biological Conclusion:

[DOA] Department Of the Army. 2007. Rough-leaved Loosestrife (*Lysimachia asperulifolia*). [http://www.bragg.army.mil/esb/rough-leaved\\_loosestife.htm](http://www.bragg.army.mil/esb/rough-leaved_loosestife.htm) (Accessed: February 18, 2008).

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Rough-leaved Loosestrife Recovery Plan. Atlanta, GA. 32 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Rough-leaf Loosestrife (*Lysimachia asperulifolia*). <http://www.fws.gov/nc-es/plant/rlllooses.html> (Accessed: January 17, 2008).

### **Schweinitz's sunflower**

USFWS optimal survey window: late August-October

Habitat Description: Schweinitz's sunflower, endemic to the Piedmont of North and South Carolina. The few sites where this rhizomatous perennial herb occurs in relatively natural vegetation are found in Xeric Hardpan Forests. The species is also found along roadside rights-of-way, maintained power lines and other utility rights-of-way, edges of thickets and old pastures, clearings and edges of upland oak-pine-hickory woods and Piedmont longleaf pine forests, and other sunny or semi-sunny habitats where disturbances (*e.g.*, mowing, clearing, grazing, blow downs, storms, frequent fire) help create open or partially open areas for sunlight. It is intolerant of full shade and excessive competition from other vegetation. Schweinitz's sunflower occurs in a variety of soil series, including Badin, Cecil, Cid, Enon, Gaston, Georgeville, Iredell, Mecklenburg, Misenheimer, Secrest, Tatum, Uwharrie, and Zion, among others. It is generally found growing on shallow sandy soils with high gravel content; shallow, poor, clayey hardpans; or shallow rocky soils, especially those derived from mafic rocks.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

[USFWS] U.S. Fish and Wildlife Service. 1994. Schweinitz's Sunflower Recovery Plan. Atlanta, GA. 28 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Schweinitz's sunflower (*Helianthus schweinitzii*). <http://www.fws.gov/nc-es/plant/schwsun.html> (Accessed: January 17, 2008).

### **Seabeach amaranth**

USFWS optimal survey window: July-October

Habitat Description: Seabeach amaranth occurs on barrier island beaches where its primary habitat consists of overwash flats at accreting ends of islands, lower foredunes, and upper strands of noneroding beaches (landward of the wrack line). In rare situations, this annual is found on sand spits 160 feet or more from the base of the nearest foredune. It occasionally establishes small temporary populations in other habitats, including sound-side beaches, blowouts in



foredunes, interdunal areas, and on sand and shell material deposited for beach replenishment or as dredge spoil. The plant's habitat is sparsely vegetated with annual herbs (forbs) and, less commonly, perennial herbs (mostly grasses) and scattered shrubs. It is, however, intolerant of vegetative competition and does not occur on well-vegetated sites. The species usually is found growing on a nearly pure silica sand substrate, occasionally with shell fragments mixed in. Seabeach amaranth appears to require extensive areas of barrier island beaches and inlets that function in a relatively natural and dynamic manner. These characteristics allow it to move around in the landscape, occupying suitable habitat as it becomes available.

#### Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1996. Recovery Plan for Seabeach Amaranth (*Amaranthus pumilius*) Rafinesque. Atlanta, Georgia.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Seabeach Amaranth (*Amaranthus pumilus*). <http://www.fws.gov/nc-es/plant/seabamaranth.html> (Accessed: January 17, 2008).

#### **Sensitive joint-vetch**

USFWS optimal survey window: mid July-October

Habitat Description: Sensitive joint-vetch grows in the mildly brackish intertidal zone where plants are flooded twice daily. This annual legume prefers the marsh edge at an elevation near the upper limit of tidal fluctuation, but can also be found in swamps and on river banks. Sensitive joint-vetch normally occurs in areas with high plant diversity where annual species predominate, and can grow in sand, mud, gravel, or peat substrates. Bare to sparsely vegetated substrates appear to be a microhabitat feature of critical importance to this plant. Such microhabitats may include accreting point bars that have not yet been colonized by perennial species, areas scoured out by ice, low swales within marshes, muskrat "eat outs" where this rodent removes all of the vegetation within a small portion of the marsh, storm damaged areas, and the saturated organic sediments of some interior marshes that have local nutrient deficiencies. In North Carolina, stable populations have been found in the estuarine meander zone of tidal rivers where

sediments transported from upriver settle out and extensive marshes are formed. Additional North Carolina occurrences are also found in moist to wet roadside ditches and moist fields, but these are not considered stable populations.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Sensitive Joint-Vetch (*Aeschynomene virginica*) Recovery Plan. Hadley, Massachusetts. 55 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Sensitive Joint-vetch (Virginia Joint-vetch) in North Carolina. <http://www.fws.gov/nc-es/plant/sensjointv.html> (Accessed: January 17, 2008).

**Small-anthered bittercress**

USFWS optimal survey window: April-May

Habitat Description: Small-anthered bittercress is endemic to the Dan River drainage of Roanoke River sub basin 03-02-01. This biennial or perennial herb occurs in moist, wet woods along small to intermittent sized streams, stream bank edges and seepages above the actual stream channel, wet rock crevices, and sand and gravel bars of small streams. This species prefers areas that are fully or partially shaded by shrubs and trees, but can occasionally be found in full sun. Soil series that it occurs on include Rion, Pacolet, and Wateree. Poorly viable occurrences may be found in disturbed areas subject to livestock trampling, silviculture, or encroachment by exotic, invasive species such as Japanese honeysuckle.

**Biological Conclusion:**

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Radford, A.E., H.E. Ahles, and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. University of North Carolina Press, Chapel Hill, NC. 1,183 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1991. Small-anthered Bittercress Recovery Plan. Atlanta, GA. 22 pp.

[USFWS] U.S. Fish and Wildlife Service. 2005. Surveys for *Cardamine micranthera*. Memorandum from Marella Buncick, USFWS, Asheville Office, to Karen Lynch, North Carolina Department of Transportation. 1 p.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Small-anthered Bittercress in North Carolina. <http://www.fws.gov/nc-es/plant/sabittercress.html> (Accessed: January 18, 2008).

### **Small whorled pogonia**

USFWS optimal survey window: mid May-early July

Habitat Description: Small whorled pogonia occurs in young as well as maturing (second to third successional growth) mixed-deciduous or mixed-deciduous/coniferous forests. It does not appear to exhibit strong affinities for a particular aspect, soil type, or underlying geologic substrate. In North Carolina, the perennial orchid is typically found in open, dry deciduous woods and is often associated with white pine and rhododendron. The species may also be found on dry, rocky, wooded slopes; moist slopes; ravines lacking stream channels; or slope bases near braided channels of vernal streams. The understory structure and composition of occupied sites varies from dense rhododendron thickets, to open/sparse/moderate shrub and herbaceous cover in the orchid's microhabitat, to dense stands of New York fern. Other common characteristics shared by small whorled pogonia sites include historic agricultural use of existing habitat; a proximity to logging roads, streams, or other features that create long persisting breaks in the forest canopy; and a prevalence of leaf litter and decaying vegetation.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1992. Small Whorled Pogonia (*Isotria medeoloides*) Recovery Plan, First Revision. Newton Corner, Massachusetts. 75 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Small Whorled Pogonia in North Carolina. <http://www.fws.gov/nc-es/plant/swpogonia.html> (Accessed: January 17, 2008).

### **Smooth coneflower**

USFWS optimal survey window: late May-October

Habitat Description: Smooth coneflower, a perennial herb, is typically found in meadows, open woodlands, the ecotonal regions between meadows and woodlands, cedar barrens, dry limestone bluffs, clear cuts, and roadside and utility rights-of-way. In North Carolina, the species normally grows in magnesium- and calcium- rich soils associated with gabbro and diabase parent material, and typically occurs in Iredell, Misenheimer, and Picture soil series. It grows best where there is abundant sunlight, little competition in the herbaceous layer, and periodic disturbances (*e.g.*, regular fire regime, well-timed mowing, careful clearing) that prevents encroachment of shade-producing woody shrubs and trees. On sites where woody succession is held in check, it is characterized by a number of species with prairie affinities.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1995. Smooth Coneflower Recovery Plan. Atlanta, GA. 31 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Smooth Coneflower (*Echinacea laevigata*). <http://www.fws.gov/nc-es/plant/smooconepl.html> (Accessed: January 18, 2008).

### **Spreading avens**

USFWS optimal survey window: June-September

Habitat Description: Spreading avens occurs in areas exposed to full sun on high-elevation cliffs, outcrops, and bases of steep talus slopes. This perennial herb also occurs in thin, gravelly soils of grassy balds near summit outcrops. The species prefers a northwest aspect, but can be found on west-southwest through north-northeast aspects. Forests surrounding known occurrences are generally dominated by either red spruce-Fraser fir, northern hardwoods with scattered spruce, or high-elevation red oaks. Spreading avens typically occurs in shallow, acidic soil (such as the Burton series) in cracks and crevices of igneous, metamorphic, or metasedimentary rocks. Soils may be well drained but almost continuously wet, with soils at some known populations subject to drying out in summer due to exposure to sun and shallow depths. Known populations occur at elevations ranging from 4,296 to 6,268 feet above mean sea level. Blue Ridge goldenrod, Heller's blazing star, and Roan Mountain bluet are a few of its common associate species.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1993. Spreading Avens Recovery Plan. Atlanta, GA. 32 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Spreading Avens in North Carolina. <http://www.fws.gov/nc-es/plant/spreadavens.html> (Accessed: January 17, 2008).

### **Swamp pink**

USFWS optimal survey window: April-May

Habitat Description: Swamp pink occurs in clonal clumps in a variety of groundwater-influenced wetland habitats including southern Appalachian bogs and swamps, Atlantic white cedar swamps, swampy forests bordering meandering small streams, boggy meadows, headwater wetlands, and spring seepage areas. The perennial herb requires a constantly saturated, but not flooded, water supply. The plant often grows on hummocks formed by trees, shrubs, and sphagnum moss, and exhibits varying degrees of shade tolerance. Swamp pink occurs in acidic soils that contain a very thin layer of decomposed organic matter over a dark silt loam and a subsoil of sand, loam, and gravel. Atlantic white cedar, pitch pine, and red spruce are a few of its associate species.

Biological Conclusion:

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1991. Swamp Pink (*Helonias bullata*) Recovery Plan. Newton Corner, Massachusetts. 56 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Swamp Pink in North Carolina. <http://www.fws.gov/nc-es/plant/swamppink.html> (Accessed: January 17, 2008).

### **Virginia spiraea**

USFWS optimal survey window: May-early July

Habitat Description: Virginia spiraea occurs in flood-scoured, high-gradient sections of rocky river banks of second and third order streams. This perennial shrub also occurs on meander scrolls and point bars, natural levees, and other braided features of lower stream reaches, gorges, and canyons. The plant grows in sunny areas on moist, acidic soils, primarily over sandstone, and tends to be found in often-disturbed early successional areas. The shrub often grows in thickets, although overtopping by arboreal species or fast-growing herbaceous vegetation

eventually eliminates it. Scoured, riverine habitat sites are found where deposition occurs after high water flows, such as on floodplains and overwash islands, rather than along areas of maximum erosion. Many populations are either established among riparian debris piles where eroded vegetative modules or portions of a plant deposited during flood events, or can occur between boulders and in fine alluvial sand and other alluvial deposits.

#### Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina: Third Approximation. Natural Heritage Program, Division of Parks and Recreation, N.C. Department of Environment, Health, and Natural Resources. Raleigh, NC. 325 pp.

[USFWS] U.S. Fish and Wildlife Service. 1992. Virginia Spiraea (*Spiraea virginiana* Britton) Recovery Plan. Newton Corner, Massachusetts. 47 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. Virginia Spiraea in North Carolina. <http://www.fws.gov/nc-es/plant/vspiraea.html> (Accessed: January 17, 2008).

#### **White irisette**

USFWS optimal survey window: late May-July

Habitat Description: White irisette, endemic to the upper Piedmont of North and South Carolina, is generally found on the southeast to southwest aspect of mid-elevation mountain slopes in thin-canopied, dry-mesic Basic Oak Hickory Forests that are mature, successional, or recently logged. Occurrences are also found in open, disturbed sites such as clearings, woodland edges, roadside embankments/rights-of-way, and power line rights-of-way. Known populations occur at elevations between 1,312 and 3,280 feet above mean sea level on gentle to very steep slopes. The perennial herb prefers rich, basic soils, probably weathered from amphibolite, which are intermittently saturated with rain but well drained. The species occurs in a variety of soils, including the Ashe-Cleveland association; the Evard-Cowee complex; and Brevard, Cowee, Fannin, Greenlee, and Hayesville series. It may grow on sites where down slope runoff has removed the usual deep litter, humus, or mineral soil layers. Partial shade to direct sun is preferred, and some form of



disturbance (*e.g.*, mowing, clearing, grazing, periodic fire) is necessary to maintain its relatively open habitat.

Biological Conclusion:

NatureServe. 2007. NatureServe Explorer: An online encyclopedia of life [web application]. Version 6.2. NatureServe, Arlington, Virginia. Available <http://www.natureserve.org/explorer>. (Accessed: February 22, 2008).

[NCNHP] North Carolina Natural Heritage Program. 2001. Guide to Federally Listed Endangered and Threatened Species of North Carolina. Raleigh, NC. 134 pp.

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[USFWS] U.S. Fish and Wildlife Service. 1995. White Irisette Recovery Plan. Atlanta, Georgia. 22 pp.

[USFWS] U.S. Fish and Wildlife Service. 2006. Optimal Survey Windows for North Carolina's Federally Threatened and Endangered Plant Species. [http://www.fws.gov/nc-es/es/plant\\_survey.html](http://www.fws.gov/nc-es/es/plant_survey.html) (Accessed: February 18, 2008).

[USFWS] U.S. Fish and Wildlife Service. White Irisette in North Carolina. <http://www.fws.gov/nc-es/plant/whiteiris.html> (Accessed: January 18, 2008).